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News

Crested dinosaur pushes back dawn of feathers

Hump backed reptile may have sported primitive plumage.

Lucas Laursen

A predatory dinosaur with bony bumps on its arms and a strange hump on its back provides evidence that feathers began to appear earlier than researchers thought, according to a report in *Nature* today¹.

The new species, named *Concavenator corcovatus*, was about 4 metres long from nose to tail and lived during the Early Cretaceous period, about 130 million years ago. Its discoverers, led by palaeontologist Francisco Ortega of the National University of Distance Learning in Madrid, found the fossil in a semi-arid plateau called Las Hoyas in central Spain, which was likely to have been a subtropical wetland, comparable to the modern Everglades, during the Early Cretaceous.

But it is the bumps on the dinosaur's arms that have caused a stir: the researchers think that they may have been part of structures that anchored quills to the creature's bones.

One branch of the dinosaur family tree, called the *Coelurosauria*, is already known to have developed feathers and feather-anchoring structures. That lineage, which includes the dinosaur celebrities *Tyrannosaurus Rex* and *Velociraptor*, also contains the ancestors of modern-day birds. When Ortega and his team tried to place their find in the evolutionary tree, however, they found that subtle features such as the shape and texture of other bones placed it in the neighbouring branch of predators, the *Allosauroidea*, which until now has never had a hint of a feather.

Yet the bumps on *Concavenator*'s arms "look exactly like insertions on rather massive flight feathers on bird wings", says Michael Benton, a palaeobiologist at the University of Bristol, UK.

If Ortega and his colleagues' interpretation of the bumps is correct, it implies that dinosaurs showed feather-like structures much earlier than was thought. Because such structures are unlikely to have evolved separately in both groups, Ortega says that *Neotetanurae*, the common ancestor of the two predatory dinosaur branches, "could have been feathered". As



Concavenator corcovatus may have had quills and a mysterious hump.

Raúl Martín

Neotetanurae lived during the Middle Jurassic (175 to 161 million years ago), before the the _Coelurosauria emerged, "We're pushing back the time when bird-like structures appear," Ortega adds.

Double mystery

The fossil skeleton of *Corcovenator* is well preserved. And in addition to the small bumps that may have once hosted quills, it has a more showy claim to fame: its eleventh and twelfth vertebrae jut about twice as far from the animal's body as the rest. Unlike dinosaurs such as *Spinosaurus*, which had continuous fins or sails on their backs, *Corcovenator* seems to have had more of a short crest.

"One possibility is that it is analogous to head-crests used in visual displays," says Roger Benson, a palaeontologist at the University of Cambridge, UK. Ortega and his team agree with that possibility, but also note that such structures could be used for cooling, like an elephant's ears, or for energy storage, like a camel's hump.

Until palaeontologists find more fossils with such features, the purpose of the hump will stay a mystery. Benton says that for now, "We can't say anything about it other than: 'Isn't it weird?'"

There is another open question in relation to bird biology, Benton says: "What is the range of feather-like structures among dinosaurs which don't exist in any birds today?" The bumps on *Concavenator*'s arm evoke those on feathered birds, but may have been anchors for other structures such as bristles built from keratin, the same protein that makes up feathers, fur and nails. There may be other evolutionary dead ends like the

Concavenator's bumps among dinosaurs that modern-day bird biologists would like to know about, he adds.

"We're going to have to conceive of more dinosaurs as being more like birds," Ortega says. Benson agrees: "Most allosauroids are depicted as plodding animals quite distant from birds. What this tells us is that they may have included more bird-like species, too."

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References

1. Ortega, F. , Escaso, F. & Sanz, J. L. *Nature* **467**, 203-206 (2010).

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